REMARKS

Applicants request favorable reconsideration and withdrawal of the rejections set forth in the above-mentioned Office Action in view of the foregoing amendments and the following remarks.

Claims 5-24, 26, and 27 remain pending, with claims 5, 9, 13, 17, 21, 26, and 27 being independent. Claims 9-16 and 21-24 stand withdrawn from consideration as being directed to a non-elected invention. Claims 5, 17 and 26 have been amended. Support for the amendments can be found throughout the originally-filed disclosure, including, for example, at page 2, line 17 through page 3, line 16 of the specification. Accordingly, Applicants submit that the amendments do not include new matter.

Claims 5-8 and 26 are rejected in the Office Action under 35 U.S.C. § 103(a) as being unpatentable over Hamasaki et al. (U.S. Patent No. 5,187,583) in view of Suzuki et al. (U.S. Patent No. 5,828,407). Claims 17-20 and 27 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Gowda et al. (U.S. Patent No. 6,344,877).

Applicants respectfully traverse the rejections, and submit that the claims are patentably distinguishable from the cited references for at least the following reasons.

Independent Claims 5 and 26

Amended independent claim 5 recites an image pickup device that comprises, inter alia, a drive circuit coupled to pixels, the drive circuit outputting a pulse wave form signal for controlling a transfer switch so that a time during which the transfer switch changes from an ON state to an OFF state becomes longer than a time during which the transfer switch changes from

the OFF state to the ON state, wherein, during the ON state, charge is transferred from the photoelectric conversion unit to the floating diffusion region. Amended independent claim 26 recites a method that includes an output step with analogous features.

With respect to independent claims 5 and 26, the Office Action cites Hamasaki et al. as disclosing an image pickup device that comprises features of the claimed invention. The Office Action acknowledges, however, that Hamasaki et al. does not disclose a drive circuit or output step to output a signal to control a transfer switch as recited in independent claims 5 and 26.

In order to cure this deficiency in Hamasaki et al., the Office Action cites Suzuki. Specifically, the Office Action asserts that Suzuki discloses a drive circuit that outputs a signal for controlling a transfer switch so that a time during which the transfer switch changes from an ON state to an OFF state becomes longer than a time during which the transfer switch changes from the OFF state to the ON state.

In particular, in comparing Suzuki to the claimed invention, the Office Action makes the following assertion: "The pulse wave form signal (V_1, V_3; see fig. 4) controls the transfer switch so that a time during which said transfer switch changes from an ON state (V_L) to an OFF state (V_M/V_H) becomes longer than (readout, t2-t7) a time during which said transfer switch changes from the OFF state to the ON state (t1-t2; col. 9, lines 15-63)." Office Action p. 3.

Applicants respectfully traverse this assertion on several grounds. Initially, Applicants submit that the "ON state" of Suzuki corresponds to V_H, that is, the voltage at which a charge is transferred from the pixel to the vertical CCD. See, e.g., col. 2, lines 5-11; col. 8, lines 45-57. On the other hand, the voltage is switched between V_M and V_L in Suzuki in order to control

charge transfer in the vertical CCD. See, e.g., col. 2, lines 2-4. Further, in this regard, Applicants note that independent claims 5 and 26 have been amended recite that during the ON state, a charge is transferred from the photoelectric conversion unit to the floating diffusion region.

Applicants further submit that the time periods t1-t2 and t2-t7 do not equate to "a time during which [a] transfer switch changes from an ON state to an OFF state" nor "a time during which [a] transfer switch changes from [an] ON state to [an] OFF state," as recited in independent claims 5 and 26. As shown in Figure 4 of Suzuki, the time period t1-t2 is a period wherein the voltage is switched between V_M and V_L, which, as described above, is used to control charge transfer in the vertical CCD. Further, the time period t2-t7 in Suzuki, includes the time period t3-t6, which is the read out period. During this time period t3-t6, as clearly shown on the Figure 4 and as discussed above, the voltage is maintained at V_H. No change from an ON state to an OFF state occurs during this interval.

In Applicants' view, the change from the OFF state (V_m) to an ON state (V_H) state in Suzuki occurs at t3, and the change from the ON (V_H) state to an OFF (V_M) state occurs at t6. See, e.g., Figure 4. Times t3 and t6, however, both encompass single points, not an interval, and as such, t3 and t6 cannot be said to be longer or shorter than each other. Thus, Suzuki cannot be taken to suggest that the time period in which the transfer switch changes from an ON state to an OFF state is longer than the time period in which the transfer switch changes from the OFF state to the ON state, as recited in independent claims 5 and 26.

Applicants further submit that one of ordinary skill in the art would not look to combine

the teachings of Suzuki with Hamasaki et al., given the substantial differences in configuration of the apparatuses disclosed in the two references. Hamasaki et al. discloses a solid state imager having an amplifying element for each pixel. Specifically, Hamasaki et al. uses a transfer pulse to transfer charge from the storage 1,ST through the switch 2,OG to the floating diffusion FD. On the other hand, Suzuki discloses a solid state imaging device where charge is transferred to both a vertical CCD and horizontal CCD. Further, Suzuki discloses transfer pulses V_1 - V_4 that include both a pulse that transfers charge between vertical CCDs and a pulse that transfers charge from a pixel to the vertical CCD. Given these fundamental differences in how pulses are used in the two different apparatus, Applicants submit that one of ordinary skill in the art would readily look modify characteristics of the pulse in Hamasaki et al. based on the teachings of Suzuki et al., absent impermissible hindsight of Applicants' disclosed invention.

For at least the foregoing reasons, Applicants submit that the combination of Hamasaki et al. and Suzuki et al. fails to disclose or suggest the invention recited in amended independent claims 5 and 26.

Independent Claims 17 and 27

With respect to independent claims 17 and 27, the Office Action asserts that Gowda et al. discloses an image pickup devices with features of the claimed invention. The Office Action acknowledges that Gowda et al. does not disclose a fall speed Voff for changing a transfer switch from an ON state to an OFF state that has a relation 10 V/μsec > Voff. The Office Action asserts, however, that such a fall speed in well known in the art. Thus, the Office Action concludes that it would have been obvious to one of ordinary skill in the art to modify the driving

circuit of Gowda et al. to have the claimed fall speed "in order to facilitate high-speed imaging."

In response to Applicants' previous arguments that Gowda et al. does not suggest setting the maximum fall speed recited in claims 17 and 27, the Office Action asserts that Gowda et al. discloses at col. 7, lines 16-23 and col. 8, lines 29-40, a driver with a fall speed V_{off} for changing a transfer switch from an ON state to an OFF state having a relation of 1.2, 1.8, 2.5, 3.3, or 5 volts on the order of 2 μsec.

Applicants respectfully traverse this factual finding of the Office Action. At col. 7, lines 16-23, Gowda et al. discloses that a "High" potential for the various waveforms discussed in the reference is typically 1.2, 1.8, 2.5, 3.3, or 5 volts. At col. 8, lines 29-40, Gowda et al. discloses the timing of a charge transfer interval being two microseconds, with the time being represented by time t4 in Figures 5 and 6. This "charge transfer interval" of Gowda et al., however, is not a period in which the transfer switch is changed from an ON state to an OFF state, and hence, does not have a "fall speed." Instead, the charge transfer interval is a period in which the drive circuit in Gowda et al. maintains an ON state to read out pixels by applying a constant voltage. See, e.g., Figures 5 and 6 showing that during the charge transfer interval t4, the row select voltage remains constant at the high voltage. In this context, the "two microseconds" referred to for the charge transfer interval at col. 8, lines 39-40, is merely the amount of time that the "ON" voltage is applied to read out the pixels. It has no relation to a fall speed in which a transfer switch is changed from an ON state to an OFF state.

In anything, it appears that Gowda et al. discloses period in which a transfer switch is changed from an ON to an OFF state as taking place at "t5," wherein the ROW SELECT voltage

is lowered from the high voltage to the low voltage. See Figure 6. As Gowda et al. shows the fall in voltage to occur at an instantaneous point of time t5, and not over an "interval" (such as indicated for the charge transfer interval t4), Applicants submit that the reference suggests that to "facilitate high-speed imaging," one would not look to create a maximum fall speed for the voltage change from the ON to OFF state. Instead, one of ordinary skill in the art would look to increase the fall speed as much as possible in order to correspondingly increase the speed of imaging, and, hence, the instantaneous point of time t5 for the voltage charge.

Thus, as substantially discussed in the previous Amendment, Applicants submit that one of ordinary skill in the art looking to "facilitate high-speed imaging" in Gowda et al. would not look to create a maximum fall speed as recited in the claimed invention. Instead, one of ordinary skill in the art would look to increase the fall speed as much as possible in order to correspondingly increase the speed of imaging. Hence, the Office Action does not set forth a proper rationale for modifying Gowda et al., and, in Applicants' view, no such rationale is suggested by the art of record. Accordingly, the Section 103 rejection of claims 17 and 27 in view of Gowada et al. should be withdrawn.

For at least the foregoing reasons, Applicants submit that Gowda et al. fails to disclose or suggest the invention recited in independent claims 17 and 27.

* * * *

The other claims are allowable by virtue of their dependency and in their own right by reciting further features of the invention. Individual consideration of the dependent claims is respectfully requested.

In view of the foregoing amendments and remarks, it is respectfully submitted that the application is in condition for allowance. Favorable reconsideration and early passage to issue of the application are earnestly solicited.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,

/Donald H. Heckenberg, Jr./

Donald H. Heckenberg, Jr.
Attorney for Applicants
Registration No. 60,081

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3801
Facsimile: (212) 218-2200
DHH:mtb

FCHS_WS 2920313v1